

What is claimed is:

1. A method for allocating a spare area on a recording medium of write-once type, the method comprising:

allocating a data area on the recording medium; and

allocating a user data area and at least one spare area within the data area on the recording medium, the at least one spare area having a variable size,

wherein a maximum recording capacity of the at least one spare area on the recording medium is less than a maximum recording capacity of at least one variable spare area on a rewritable type optical disc.

2. The method as claimed in claim 1, wherein the recording medium is a write-once blu-ray disc (BD-WO) and the rewritable optical disc is a rewritable blu-ray disc (BD-RE).

3. A method for allocating a spare area on a recording medium of write-once type, the recording medium including at least one recording layer, the method comprising:

allocating a data area on the at least one recording layer of the recording medium; and

allocating a user data area and at least one spare area within the data area on the recording medium, the at least one spare area having at least one replacement area, the at least one replacement area having a variable size and

constituting a part of the at least one spare area or the entire at least one spare area,

wherein a maximum ratio of a size of the at least one replacement area to a size of the user data area is less than about 5%.

4. The method as claimed in claim 3, wherein the at least one recording layer is a single recording layer, the recording layer including the user data area, an inner spare area, and an outer spare area, and

the inner spare area is allocated to have a predetermined fixed size and the outer spare area is allocated to have a size of $N \times 256$ clusters.

5. The method as claimed in claim 4, wherein N is greater than zero and ≤ 32 .

6. The method as claimed in claim 5, wherein a maximum ratio of a total size of the inner and outer spare areas to the size of the user data area is about 3%.

7. The method as claimed in claim 4, wherein N is greater than zero and ≤ 64 .

8. The method as claimed in claim 7, wherein a maximum ratio of a total size of the replacement area of the inner and outer spare areas to the size of the user data area is about 4%.

9. The method as claimed in claim 4, wherein the outer spare area includes a replacement area and an interim defect management area for temporarily storing defect management information therein.

10. The method as claimed in claim 9, wherein a size of the interim defect management area is about a quarter of a size of the outer spare area.

11. The method as claimed in claim 9, further comprising:

allocating a lead-in area on the single recording layer of the recording medium, the lead-in area including a temporary defect management area for temporarily storing defect management information therein.

12. The method as claimed in claim 3, wherein the at least one recording layer includes first and second recording layers, the first recording layer including a first user data area, a first inner spare area and a first outer spare area, the second recording layer including a second user data area, a second inner spare area, and a second outer spare area, and

the first inner spare area is allocated to have a predetermined fixed size and the second inner spare area is allocated to have a size of $L \times 256$ clusters where L is equal to or greater than zero.

13. The method as claimed in claim 12, wherein each of the first and second outer spare areas is allocated to a size of $N \times 256$ clusters where N is greater than zero.

14. The method as claimed in claim 13, wherein at least one of the second inner spare area, the first outer spare area and the second outer spare area includes an interim defect management area for storing defect management information therein.

15. The method as claimed in claim 14, wherein a size of the interim defect management area is about a quarter of a size of the corresponding inner spare area or outer spare area.

16. The method as claimed in claim 14, further comprising:
allocating a lead-in area on the first recording layer and a lead-out area on the second recording layer, at least one of the lead-in and lead-out areas including a temporary defect management area for storing defect management information therein.

17. The method as claimed in claim 13, wherein $0 < N \leq 16$ and $0 < L \leq 32$.

18. The method as claimed in claim 17, wherein a maximum ratio of a total size of the inner and outer spare areas to a total size of the user data areas is about 3%.

19. The method as claimed in claim 13, wherein $0 < N \leq 32$ and $0 < L \leq 64$.

20. The method as claimed in claim 19, wherein a maximum ratio of a total size of replacement areas of the inner and outer spare areas to a total size of the user data area is about 4%.

21. The method as claimed in claim 3, wherein the recording medium is a write-once blu-ray disc (BD-WO).

22. An apparatus for allocating a spare area on a recording medium of write-once type, the apparatus comprising:

means for allocating a data area on the recording medium; and

means for allocating a user data area and at least one spare area within the data area on the recording medium, the at least one spare area having a variable size,

wherein a maximum recording capacity of the at least one spare area on the recording medium is less than a maximum recording capacity of at least one variable spare area on a rewritable type optical disc.

23. An apparatus for allocating a spare area on a recording medium of write-once type, the recording medium including at least one recording layer, the apparatus comprising:

means for allocating a data area on the at least one recording layer of the recording medium; and

means for allocating a user data area and at least one spare area within the data area on the recording medium, the at least one spare area having at least one replacement area, the at least one replacement area having a variable size and constituting a part of the at least one spare area or the entire at least one spare area,

wherein a maximum ratio of a size of the at least one replacement area to a size of the user data area is less than about 5%.

24. A recording medium of write-once type, the recording medium comprising:

a data area allocated on the recording medium, the data area including a user data area and at least one spare area, the at least one spare area having a variable size,

wherein a maximum recording capacity of the at least one spare area on the recording medium is less than a maximum recording capacity of at least one variable spare area on a rewritable type optical disc.

25. The recording medium as claimed in claim 24, wherein the recording medium is a write-once blu-ray disc (BD-WO) and the rewritable optical disc is a rewritable blu-ray disc (BD-RE).

26. A recording medium of write-once type, the recording medium comprising:

at least one recording layer; and

a data area allocated on the at least one recording layer, the data area including a user data area and at least one spare area, the at least one spare area having at least one replacement area, the at least one replacement area having a variable size and constituting a part of the at least one spare area or the entire at least one spare area,

wherein a maximum ratio of a size of the at least one replacement area to a size of the user data area is less than about 5%.

27. The recording medium as claimed in claim 26, wherein the at least one recording layer is a single recording layer, the recording layer including the user data area, an inner spare area, and an outer spare area, and

the inner spare area is allocated to have a predetermined fixed size and the outer spare area is allocated to have a size of $N \times 256$ clusters.

28. The recording medium as claimed in claim 27, wherein N is greater than zero and ≤ 32 .

29. The recording medium as claimed in claim 28, wherein a maximum ratio of a total size of the inner and outer spare areas to the size of the user data area is about 3%.

30. The recording medium as claimed in claim 27, wherein N is greater than zero and ≤ 64 .

31. The recording medium as claimed in claim 30, wherein a maximum ratio of a total size of the replacement area of the inner and outer spare areas to the size of the user data area is about 4%.

32. The recording medium as claimed in claim 27, wherein the outer spare area includes a replacement area and an interim defect management area for temporarily storing defect management information therein.

33. The recording medium as claimed in claim 32, wherein a size of the interim defect management area is about a quarter of a size of the outer spare area.

34. The recording medium as claimed in claim 32, further comprising:
allocating a lead-in area on the single recording layer of the recording medium, the lead-in area including a temporary defect management area for temporarily storing defect management information therein.

35. The recording medium as claimed in claim 26, wherein the at least one recording layer includes first and second recording layers, the first recording layer including a first user data area, a first inner spare area and a

first outer spare area, the second recording layer including a second user data area, a second inner spare area, and a second outer spare area, and

the first inner spare area is allocated to have a predetermined fixed size and the second inner spare area is allocated to have a size of $L \times 256$ clusters where L is equal to or greater than zero.

36. The recording medium as claimed in claim 35, wherein each of the first and second outer spare areas is allocated to a size of $N \times 256$ clusters where N is greater than zero.

37. The recording medium as claimed in claim 36, wherein at least one of the second inner spare area, the first outer spare area and the second outer spare area includes an interim defect management area for storing defect management information therein.

38. The recording medium as claimed in claim 37, wherein a size of the interim defect management area is about a quarter of a size of the corresponding inner spare area or outer spare area.

39. The recording medium as claimed in claim 37, further comprising:

allocating a lead-in area on the first recording layer and a lead-out area on the second recording layer, at least one of the lead-in and lead-out areas including a temporary defect management area for storing defect management information therein.

40. The recording medium as claimed in claim 36, wherein $0 < N \leq 16$ and $0 < L \leq 32$.

41. The recording medium as claimed in claim 40, wherein a maximum ratio of a total size of the inner and outer spare areas to a total size of the user data areas is about 3%.

42. The recording medium as claimed in claim 36, wherein $0 < N \leq 32$ and $0 < L \leq 64$.

43. The recording medium as claimed in claim 42, wherein a maximum ratio of a total size of replacement areas of the inner and outer spare areas to a total size of the user data area is about 4%.

44. The recording medium as claimed in claim 26, wherein the recording medium is a write-once blu-ray disc (BD-WO).